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AUTHOR	Plowman, Lydia; Mateer, John; Leakey, Alison
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ABSTRACT

The aims of CREATIS (Creating the Information Society) were to provide the West Lothian (Scotland) community with the highest quality information technology (IT) learning opportunities, a high capacity communications infrastructure and a hardware base that would: connect West Lothian's schools, libraries and community education centers to the West Lothian Council's wide area network; provide desktop computers for those sites; enable data and email to be transmitted between all those sites; provide access to the Internet via a gateway connected to the Council's core network; and provide video conferencing facilities. The study provides a baseline for measuring future progress of West Lothian's ICT infrastructure, services and impact as well as providing evidence to inform developments of the National Grid for Learning (NGfL) across Scotland. This report emphasizes the impact of CREATIS on teaching and learning in schools, although the study gives an indication of patterns of usage in libraries and the community. The Introduction is provided in Chapter 1. Chapter 2 describes the aims of the evaluation and the methods of collecting and analyzing data. Chapter 3 presents findings from the mail survey of all teaching staff in West Lothian and Chapter 4 presents findings from the case studies. Chapters 5 and 6 focus on libraries and community education centres. The technical assessment presented in Chapter 7 includes findings from schools, libraries and community education centres. Chapter 8 considers the appropriateness of the technical solution implemented in CREATIS and Chapter 9 integrates the findings from the survey and case studies to discuss its impact on teaching and learning in schools. Chapter 10 considers the implications for technical support and training and Chapter 11 considers the impact of CREATIS on the community by integrating findings from the chapters on schools, libraries and

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community education centers. Conclusions are presented in Chapter 12. A glossary is appended. (AEF)

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Connecting Schools, Libraries and Community Education Centres with ICT:

An Evaluation of the CREATIS Project

Lydia Plowman (University of Stirling), John Mateer (University of York and Interactive Future UK) and Alison Leakey (Donaldson's College, Edinburgh)

Over the period from 1997 to 2000, the Scottish Executive and West Lothian Council jointly funded networking the local authority with the aim of promoting learning opportunities and social inclusion. This placed West Lothian in the forefront of developments in ICT as it preceded the National Grid for Learning (NGfL) and involved connecting libraries and community education centres to the network as well as schools. An analysis of the project's development is instructive for the continuing expansion of ICT services nationally and by local authorities.

Background

Local government reorganisation in April 1996 provided an opportunity for the newly formed West Lothian Council to develop its information and communication technologies (ICT) strategy, particularly with regard to education and social inclusion. The aim of the CREATIS (Creating the Information Society) project, developed as a response to these needs, was to provide networked computers in libraries and community education centres, as well as schools. This would mean that people without access to computers at home were not excluded from the information society. The scheme was funded jointly by the Scottish Office Challenge Fund and West Lothian Council for a three-year period from March 1997. The project preceded the National Grid for Learning (NGfL) but was later subsumed by it and so it is no longer known as CREATIS.

The aims of CREATIS were to:

- create a computer network infrastructure to connect West Lothian's 11 secondary schools, 65 primary schools, 4 special schools, 14 public libraries and 40 community education centres to the Council's wide area network (WAN)
- provide desktop computers for those sites
- provide access to the internet
- provide video conferencing facilities for use between secondary schools.

By June 2001 the network had more than 30,000 users, had connected all the intended 140 sites (including nursery, primary and secondary schools, libraries and community education centres) and provided more than 6000 computers and 100 servers.

To date, CREATIS computers and network access are widely used in schools and libraries. Community education centres have hardware and network access for administrative use, although the extent of public access is variable. This contrasts with the situation before the implementation of the CREATIS infrastructure, as there were very few sites with any local computer network systems in place and no council-wide email service, internet access or council intranet.

The Evaluation

The Scottish Executive Education Department and West Lothian Council commissioned the evaluation of CREATIS. Most of the data for this evaluation was collected in the first six months of 2001 and we completed the evaluation at the end of 2001. There is a programme of continuous upgrading of equipment and technical support services so there have been a number of changes since then and patterns of use are still emerging.

The aims of the evaluation were to answer the following questions:

- What is the impact on teaching and learning in schools?
- What are the implications for technical support and training?
- What is the impact on the community?
- How appropriate is the technical solution?

This Interchange focuses on teaching and learning in schools and, to a lesser extent, impact on the community. It does not discuss the technical solution employed by West Lothian except as it is experienced directly by its users.

Approach

We used a variety of approaches for collecting evidence. This enabled us to gain a big picture of the implementation of ICT in the authority whilst also giving insight into the daily experience of practitioners. The main methods of data collection were an initial scoping study consisting of interviews with key stakeholders and the identification of relevant documents; a detailed technical assessment; case studies consisting of site visits, interviews and diaries; and a postal survey of all 1650 teachers in West Lothian.

We received 775 responses from the **survey**, about half of the total number of teachers. Of these, 50% were from primary schools, 46% from secondary schools and 3% from special schools. Men accounted for 25% and women for 75% of responses. These figures are representative of the teaching staff in West Lothian in terms of gender and the sector in which they teach.

The **case studies** were based on two secondary schools along with the libraries, community education centres and primary schools in their areas. Four libraries, six community education centres and eight schools took part in the case studies. Twenty-five teachers completed diaries of ICT use over a five-day period and we conducted 38 interviews with teachers.

We conducted **telephone interviews** with a further six libraries and eight community education centres to supplement the case study data. The **technical assessment** took place at four schools, two libraries and two community education centres and involved interviews with system managers and hands-on, timed assessments of different aspects of system performance.

Management perspectives were provided by the scoping study and the technical assessment as well as an interview with at least one member of the senior management team in each school. The interviews in the libraries and community education centres were typically with the site or branch manager. The views of pupils and users of library and community education services were solicited on an ad hoc basis.

Case studies use multiple sources of evidence from a real-life context and can provide more depth of information than a survey. The survey tells us how frequently or infrequently teachers and pupils use different technologies but it does not tell us a great deal about the underlying reasons for these patterns of use. The survey provides a snapshot of a situation at a given time, whereas case studies can include a historical dimension as well as providing insights into possible future developments. Combining different methods enables us to see the situation from different perspectives, thus making the evaluation more robust than using either method in isolation.

What is the impact on teaching and learning in schools?

Three-quarters of respondents had internet access from a computer at home and more than three-quarters were 'very comfortable' or 'comfortable' searching the web, using email, finding information on CD-ROMs and using a word processor. This suggests that there is a bias towards active users of ICT in the survey findings.

Access to ICT

Figure 1 shows that the most recent figures available indicate that the pupil:computer ratio in West Lothian was 12.5:1 in primary schools and 3:1 in secondary schools, well above the national figures published by the Scottish Executive (2001). However, although West Lothian is ahead of the NGfL targets for secondary schools, this is not the case for primary schools.

Figure 1: A comparison of pupil:computer ratios in West Lothian and Scotland

	WEST LOTHIAN 2000/2001	SCOTLAND Sept. 2000	NGL TARGET 2002
Pupil: computer ratio (primary)	12.5:1 (1999/2000)	18:1	7.5:1
Pupil:computer ratio (secondary)	3:1	7:1	5:1

All pupils and teachers in West Lothian schools have their own email address. Figure 2 compares this with the most recent figures for the percentage of pupils and teachers with their own email address across Scotland.

Figure 2: A comparison of email and internet access in West Lothian and Scotland

	WEST LOTHIAN 2000/2001		SCOTLAND September 2000	
	primary (%)	secondary(%)	primary(%)	secondary (%)
Pupil email addresses	100	100	6	43
Teacher email addresses	100	100	21	52
School internet connection	100	100	63	85

The survey added to this existing data by asking 'Does your school have a sufficient quantity of the following items of equipment to enable adequate access for teaching and learning activities?' Responses were given for two categories: a) personal use by teachers for schoolwork such as lesson preparation and administration and b) for use by pupils in lessons. Figure 3 shows that access to ICT for personal use is generally higher than it is for use by pupils in lessons. The responses are further divided into those for primary and secondary schools.

The diaries indicate that a majority of teachers used a computer every day and that where teachers had access to computers on their own desk the use *both in and out of lessons* was higher than for other schools as it enabled teachers to build their confidence away from their pupils' scrutiny. A secondary school

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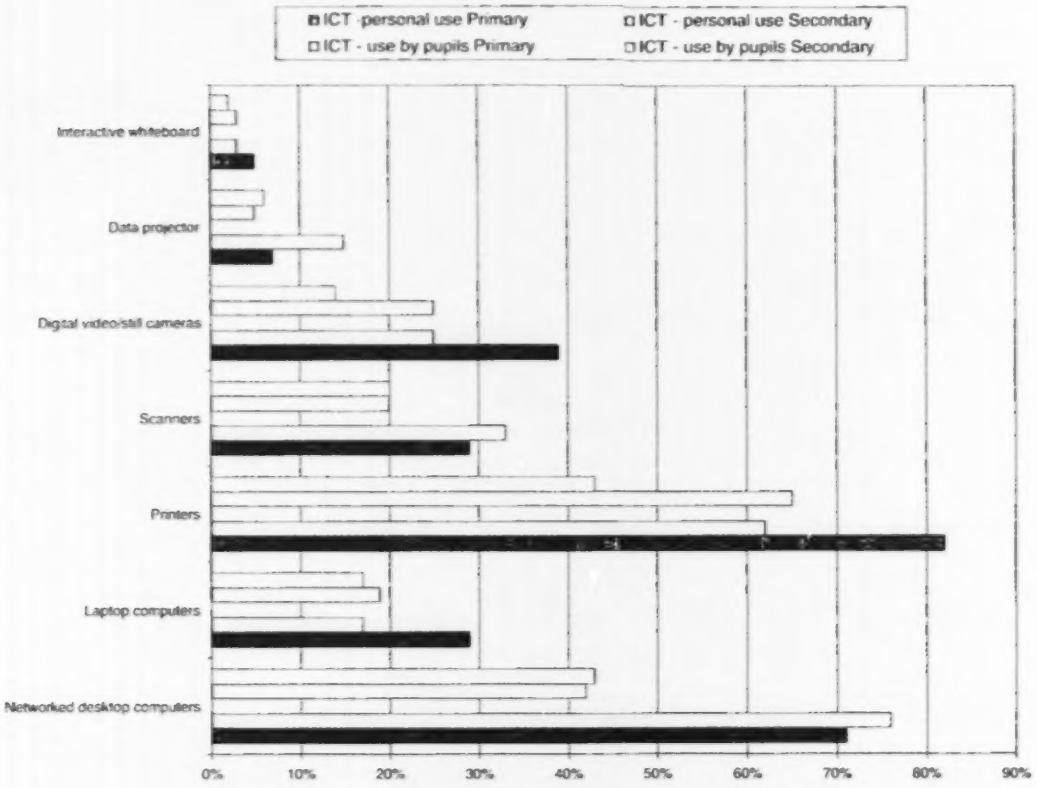
that had prioritised providing a computer for every teacher was able to use email for daily bulletins and general administration. ICT thus became embedded in the working lives of teachers, the first step towards integrating ICT in lessons.

Figure 3: Adequate access to ICT for personal use and use by pupils: a comparison of primary and secondary schools



The role of laptop computers in improving teachers' confidence with ICT is widely acknowledged (Harrison et al, 1998) but Figure 3 shows that less than a third (29%) of primary school teachers and less than a fifth (17%) of secondary school teachers perceive themselves to have adequate access to laptops for *personal use*. Laptops are also considered to have a positive impact on the management of learning in the classroom but less than a fifth of teachers in both primary and secondary schools consider access to be adequate for use by pupils *in lessons*. There has been some increase in provision of laptop computers since the survey took place in spring 2001.

Do the teachers in your school have either their own laptop or a computer on their own desk or study area? What impact does this have in terms of day to day administration and building confidence in the use of ICT? Does it make a difference to how often ICT is used in lessons?

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Differences between primary and secondary schools

Figure 3 shows little sectoral difference in teachers' views on whether they have adequate access to networked desktop computers although there are approximately four times as many desktop computers to pupils in West Lothian secondary schools as there are in primary schools. The case studies and responses to the open questions on the survey show that there is uneven distribution of computers within secondary schools, with some departments monopolising the equipment. This would leave many of their colleagues feeling that they did not have adequate access and explains why *perceptions* of provision do not reflect the statistics for West Lothian.

Do you know what the pupil:computer ratio is in your school? Does your access to computers for use in lessons reflect this ratio or do some year groups or subject areas seem to get disproportionate access? Is the pupil:computer ratio a useful measure of access?

Primary schools have slightly better access to laptop computers than secondary schools. Some primary schools now prioritise the purchase of laptop computers as they can easily be shared between classes and can solve some of the problems caused by space restrictions and the inadequate number and location of power sockets. However, schools can typically buy up to two desktop computers for the price of one laptop computer. This means that the pupil:computer ratio can be distorted for primary schools, even though the amount of use per laptop is potentially higher than for desktop computers.

Differences between the primary and secondary sectors are also apparent in access to software for use as a resource in lessons. About two-thirds of teachers in primary schools consider they have adequate access compared to less than half of secondary school teachers.

The diaries show that Primary 4 pupils generally work at computers in pairs. By Primary 7 pupils used the computers individually or in pairs and, to a lesser extent, in groups. In the secondary classes, pupils were six times more likely to use the computer individually than in pairs. None of the primary or secondary teachers recorded whole-class use of computers, although interactive whiteboards have become more widely available since the study took place and this approach to teaching with computers may become more prevalent.

Obstacles to use

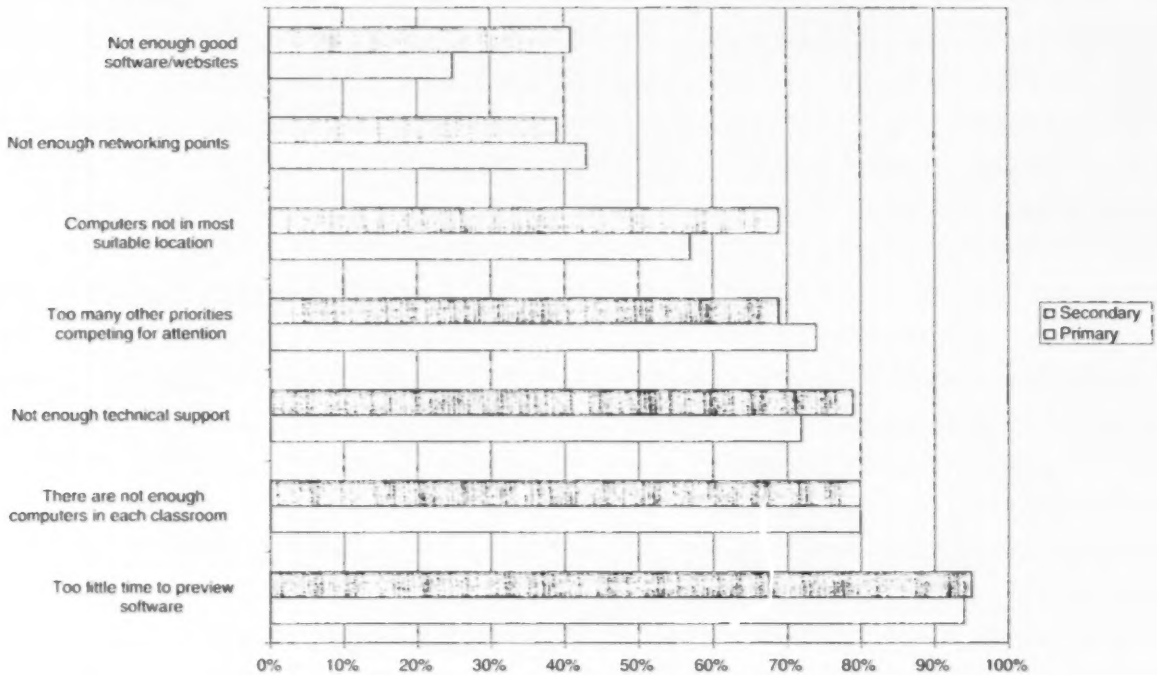
The availability of appropriate hardware and software clearly influences the extent to which teachers use ICT: 68% of primary school teachers and 79% of secondary school teachers said they would use ICT more than they do now if they had unrestricted access.

The main perceived obstacles to using ICT (Figure 4) were lack of time to preview software (94%), not enough computers in each classroom (79%) and lack of technical support (75%). The *Impact of ICT Initiatives* study (Stark et al, 2000) reports identical figures for lack of time to preview software as an obstacle to using ICT and similar figures (75%) for the lack of computers in the classroom in primary schools. The case studies reinforce these findings.

From a school management perspective, the main obstacles are the ICT skills of individual staff and their ability to incorporate ICT into the curriculum. As nearly half of teachers consider that lessons are more difficult to manage if ICT is involved there is a clear training need.

What are the main obstacles to use of ICT in your school? What are the possible solutions?

Figure 4: Obstacles to using ICT



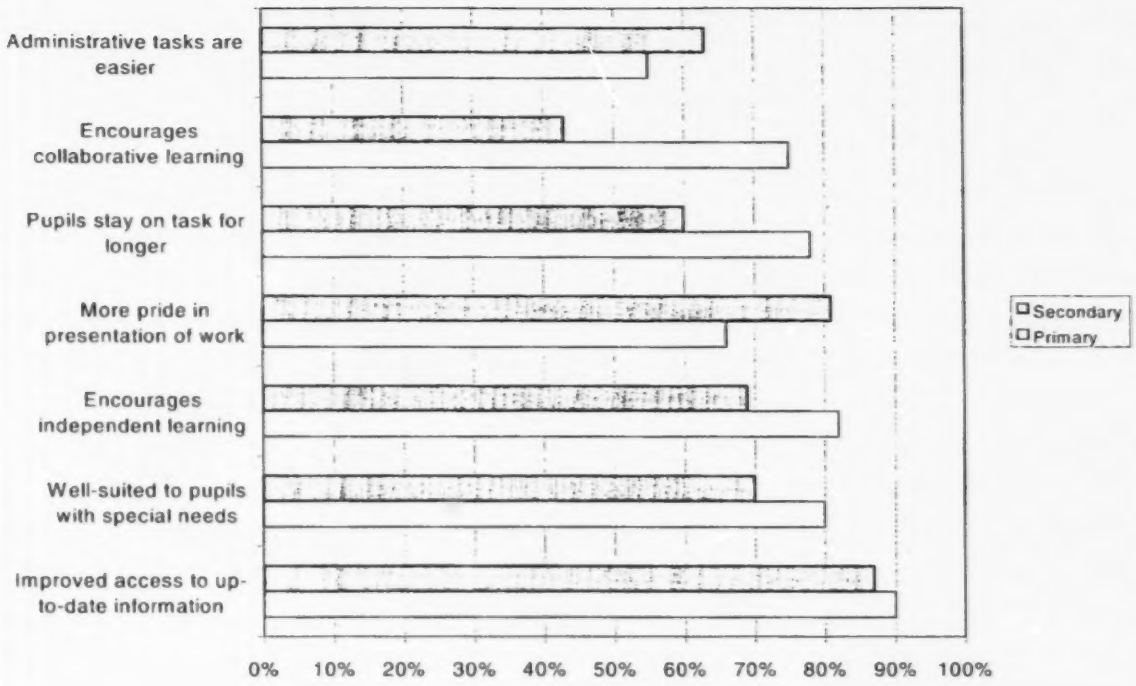
The benefits of ICT

Survey respondents split fairly evenly three ways in their responses to the statement 'I can attribute an increase in pupils' attainment to the use of ICT', with 30% disagreeing, 35% agreeing and 35% saying they did not know. As much of the government's spending on ICT is founded on the desire to raise attainment, the 65% of teachers who either do not know or do not believe that ICT increases attainment present an interesting challenge.

Although many teachers may feel that there is insufficient evidence to claim a direct link to attainment they did recognise that the use of ICT had benefits related to learning. Figure 5 shows that the highest rated benefit was for improved access to up-to-date information (88%), followed by value for pupils with special needs and facilitating independent learning (both 75%). Only 15% of teachers stated that they have yet to be convinced of the value of ICT but the sample who responded to the survey were likely to be positively biased towards its use.

What are your own views on the links between attainment and the use of ICT? Do you have any evidence one way or the other?

Figure 5: The benefits of using ICT



Using ICT

The main ICT activity *in lessons*, used weekly or more frequently, is word processing (54%), followed by using CD-ROMs (44%), using drawing packages (31%) and searching for information on the web (27%). The main activities by teachers *out of lessons* are word processing (79%), email (53%), searching the web (43%) and using CD-ROMs (39%). Over half of teachers stated that using the web had a positive effect on their work but about half consider that access to the web is too slow to integrate it into lessons. Video conferencing is barely used.

Training

At the time of the survey in spring 2001, over a third of primary and a quarter of secondary teachers in West Lothian had started the New Opportunities Fund (NOF) ICT training and about a third of teachers had attended ICT training from other sources. More teachers state that ICT training does not meet their needs (46%) than are satisfied with it (42%).

The general view stated in the case study interviews was that NOF training was not sufficiently relevant to the curriculum and supported self-study packages were not a popular mode of delivery. Primary school teachers prefer the hands-on training offered by their own ICT coordinators.

Technical support

Primary ICT coordinators report a higher frequency of technical breakdowns than the secondary schools and, as none of them have on-site technicians, they wait longer for technical help. Printers, email, installation of software and poor internet access were listed as their main problems. The most common technical problems in the secondary schools were software conflicts and staff email accounts.

Three-quarters of teachers state that they do not have enough technical support. Nearly three-quarters of primary school teachers and half of secondary school teachers 'sometimes' or 'frequently' had to abandon or alter a lesson plan due to technical problems but some ICT coordinators and school managers feel that some of these problems are due to lack of staff skills in sorting out fairly basic problems.

Most ICT coordinators and network managers are also classroom teachers. This emphasises the importance of integrating ICT into the curriculum and avoids the use of ICT being seen as mainly concerned with technical issues. These people are highly valued but the combined responsibility for ICT within the school as a whole and their own teaching commitments means that their workload is very high and colleagues are reluctant to trouble them for assistance. The amount of time spent on managing ICT in primary schools ranged from one hour to five hours per week. The primary school ICT coordinators had received considerably less training than the network managers in the secondary schools.

West Lothian has introduced a new system in which non-teaching staff provide initial troubleshooting assistance. This should allow ICT coordinators to focus on training rather than routine troubleshooting. More training should also decrease the amount of troubleshooting required as teachers will be more able to self-diagnose and deal with simple problems.

Do you tend to use informal mechanisms for getting technical support in your school or do you have well established procedures? What impact would easily accessible technical support have on your own teaching?

Discussion

For the purposes of this evaluation, impact on teaching and learning has been interpreted considerably more broadly than impact on attainment. Indeed, to speak of the *impact* of ICT on learning risks implying that it is the technology rather than other factors which is the key variable. In a school context, teachers are probably the most important variable in effective use of ICT, assuming adequate provision. This is because it is teachers who mediate its use and pupils' learning outcomes are influenced by different styles of teaching and managing ICT in the classroom.

Teachers do not, however, control the use of ICT; generally, they decide the extent to which they implement decisions that have been taken at school, authority or national levels. The three main obstacles to the integration of ICT into learning are the result of a deficiency of different types of resource: time, equipment (both hardware and software) and support. None of these is directly in the control of classroom teachers and effective use of ICT depends on a range of political, economic and cultural factors, not just the disposition of individual teachers.

Which resource would have the most beneficial impact on your teaching? More time, more hardware and software or more technical support?

The pupil:computer ratio takes no account of replacement costs and is therefore of limited value for illustrating sustainable levels of provision. The PCAST report (1997) estimates that the purchase price of a computer represents about 20-25% of the cost of its operation over the period of its useful life and so costs persist long after the initial investment. Many teachers and managers are genuinely worried about sustaining the existing level of technology, let alone developing it, due to replacement costs for the hardware.

Recommendations

Access

- Schools should review the distribution of computers throughout the school (particularly at secondary level) and take account of the need for ICT to be used across the curriculum rather than being concentrated in specific areas.
- There is an urgent need for an increase in provision of computers in primary schools.
- All schools would benefit from the use of readily accessible data projectors or interactive whiteboards for whole-class teaching.
- All schools would benefit from more laptop computers on wireless networks.
- The provision of a computer on every teacher's desk should be accelerated. Once achieved, schools should use email for daily bulletins and general administration.

Content

- The curriculum support teams should strengthen the advice they are able to give schools on selecting software and websites and publicise this service.
- Authorities should investigate the possibility of licensing and supporting some core software titles.
- Nationally, this support should take the form of an easily searchable and navigable website with links between 5-14 guidelines, lesson plans and relevant sections from a list of supported software, plus links to other sites.

Training

- Each school should have a clear job description for the ICT coordinator which specifies the non-contact time available for the responsibility. A programme of training and opportunities for mutual support should be designed specifically for the role of primary ICT coordinators.
- A review of different models of providing training should be carried out and its findings used to inform how teachers' training needs can best be met, their preferred mode of delivery and whether accreditation is required. This should include an investigation of the role of curriculum

support teams in promoting the use of ICT in subject-specific areas and the role of ICT development groups.

- ICT training courses for teachers should emphasise the classroom management of learning using ICT and provide subject-specific guidance. Some teachers require more training in basic skills.

Technical support

- A comparative review of different approaches to technical support (both within and outwith education) and a cost-benefit analysis of these approaches should be conducted.

What is the impact on the community?

One of the aims of this project was to provide networked computers in libraries and community education centres so that people without access to computers at home were not excluded from the information society. Although the emphasis of this evaluation was on the use of ICT in schools, we also investigated its use in libraries and community education centres.

Libraries

As a result of CREATIS the library service has 29 public terminals, all of which can access the internet and provide Microsoft Office. CREATIS also funded WebPAC, the web interface to the library catalogue, and this provides access from any home, school, office or library internet connection. This access includes self-service online reservation and loan renewal. Online reservations now account for 20% of all reservations, about a quarter of which are placed outwith library opening hours.

All schools have access to library stock via WebPAC. Although teachers have been given a library pack containing a user's guide to WebPAC and a library card for classroom use there has so far been a low level of awareness of the potential for school/library links.

From April 2000 to March 2001 the average number of monthly sessions using the CREATIS terminals was 1048, up from 893 in the previous year. General computer usage, including internet access, is charged at the rate of £3 per hour for adults (£1.50 for children and concessionary users), £1.50/£0.75 per hour without internet access. Sessions for schoolchildren and the unemployed are free, although all access is free from April 2002.

Schoolchildren and the unemployed are the main user groups, followed by retired people. The majority of libraries serve between 10 and 25 people who want to use the computers per week, mostly regular users, but three sites typically see up to fifty people per week (and one site up to one hundred). Usage tends to be highest in mornings and afternoons, when access is free to concessionary groups. There are few users during other periods.

Schoolchildren use the computers primarily for homework though many access web-based chat services and recreational web sites. Unemployed users

split their time between job searching and word processing and retired people predominantly use the system to send email. Overall, email is the most popular way in which the CREATIS computers at libraries are used followed closely by web browsing and general research work.

The library service offers a 'buddy' system whereby members of the public can receive free computer tuition from volunteer teachers although there are too few buddies to meet the demand for training. Staff use of computers predates CREATIS and staff have engaged in NOF-funded training.

The computer systems have been generally reliable and deployment of CREATIS has been successful. Take-up is fairly high and users appear to be satisfied, although there is a need for greater public awareness that the service exists.

Do you know whether the pupils at your school use computers in libraries or community education centres to supplement the level of access in school? Could your school do more to increase access to ICT out of hours? Could any of your pupils get involved in training novice users in the community?

Community education centres

The community education centres have an average of two CREATIS-funded computers for public use and one for administration. Deployment of computers and networking hardware to the community education centres took place in the last phase of CREATIS and the use of ICT is not as well developed at these sites as at the libraries and schools. Most staff have an email address but there is wide variety of staff interest and skills and email is not used for routine communication. The majority of staff have received no training and are self-taught.

Public access to CREATIS computers is available on a limited basis. Most access is facilitated through classes; 'off the street' access is not widely available in the way it is at libraries. Schoolchildren represent the largest user group followed by adult users and the unemployed. Evenings are the most active period for system usage, followed by afternoons. Fees for computer access are sometimes included in charges for specific classes or centre memberships but, at some sites, hourly access is available at rates similar to those in place at libraries. The average number of users in a community education centre is less than 25 per week but the present number of computers would be insufficient if public usage were to increase.

Schoolchildren use the system for homework but also for recreational web browsing and games. Word processing, for CVs and cover letters, is the main type of use by the unemployed. The most common problem cited by public users was poor internet service.

CREATIS has not facilitated links between the community education centres and the community due to a lack of publicity and the present state of the service being inadequate. Most sites had not used CREATIS to develop links with local schools.

Recommendations

- Materials should be developed by the library service to publicise the services available for schools.

- The existence of West Lothian Online should be promoted and its content improved, following research with users and non-users.
- The community education centres should provide a version of the buddy scheme already offered by the library service.
- Training should be provided for community education centre staff to improve their own skills and allow them to assist the public.
- Schools should investigate ways of using the network to develop home-school links.
- Pupils should be able to access their email account as easily from the local community education centre or library as from within the school.

Endnote

Measured against the infrastructure aims outlined in the first section, CREATIS has been a success. The infrastructure is in place and it meets the needs of most users for most of the time. But there is also an implicit aim in the name given to the project, viz. to create an information society, and we can be much less certain that this has been achieved. CREATIS has provided an initial infrastructure for an information society but the aims focus on the technology rather than its users. This study shows that the infrastructure alone is not adequate to create an information society (or, to use the current terminology, a knowledge society). Technology is necessary, but it is not sufficient.

People need to be at the centre of such a vision and this means support and training for a multiplicity of users: staff, children and members of the public. It was unfortunate that the Challenge Fund, perhaps driven by government targets on provision of equipment, did not allow for the costs of technical support or training. It is to be hoped that future schemes do not constrain developments in this way and that it is acknowledged that pupil:computer ratios are a blunt tool for measuring progress. Such ratios do not take into account the importance of a teacher:computer ratio and they measure numbers of computers rather than levels of use.

The costs of training and support of various kinds are frequently underestimated in technology-driven projects and many costs are not calculated because they have lower visibility than hardware and infrastructure. The PCAST (1997) report urges that at least 30% of educational technology budgets should be devoted to professional development. Technical support is being subsidised by teachers as staff time is diverted from teaching to troubleshooting for themselves and colleagues. Some teachers put up with faulty equipment because they do not like to seek help from harassed colleagues. These are costs known in industry as the total cost of ownership (TCO) and include professional development, software, technical support, replacement costs, bandwidth and retrofitting (ie modifying existing buildings to accommodate new technology). The total cost of ownership is not currently factored in when allocating budgets and the costs of training and technical support are not fully recognised.

The 'digital divide'

Access to and use of the internet is increasingly necessary for full participation in a knowledge economy that encompasses work, education, leisure and commerce. People who do not have the chance to participate in the use of ICT, because they have not been trained or cannot get access to computers, are likely to be disadvantaged. This is a global phenomenon when the differences between the highly developed and less developed countries are considered, but it also applies within a community such as West Lothian.

It is likely that the people in West Lothian who do not make use of CREATIS are in lower income groups, do not have high formal educational qualifications and do not have school-aged children (eg the elderly). These are the very people that the community education centres could be encouraging to determine their own needs and solutions. It is clear, for instance, that there is unmet demand from the public for basic ICT training.

CREATIS has achieved much in trying to create an information society and it has now completed the infrastructure. Establishing wide take-up and contributing to and developing a sense of community is much more difficult to achieve. The teams involved in bringing CREATIS to this point showed great foresight about the potential role of ICT in promoting social inclusion but it will take more investment in people to bring the vision to reality.

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For further information about the research, please contact

Dr. Lydia Plowman, Institute of Education, University of Stirling, Stirling FK9 4LA.

lydia.plowman@stir.ac.uk

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